| L Number | Hits | Search Text | DB | Time stamp |
|---|---|---|---|---|
| - | 292 | 340/5.64.ccls. | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 09:24 |
| - | 0 | 340/5.64.ccls. and (receiv$4 with mount$3 with meter) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 15:07 |
| - | 0 | 340/5.62.ccls. and (receiv$4 with mount$3 with meter) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 15:07 |
| - | 0 | 340/5.72.ccls. and (receiv$4 with mount$3 with meter) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 15:07 |
| - | 2 | 340/825.69.ccls. and (receiv$4 with mount$3 with meter) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 15:08 |
| - | 5 | 340/825.72.ccls. and (receiv$4 with mount$3 with meter) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 15:17 |
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| - | 1 | 307/10.1.ccls. and (receiv$4 with mount$3 with meter) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 15:22 |
| - | 5 | 5615080.URPN. | USPAT | 2004/03/16 15:20 |
| - | 8 | ("4830621" \| "4942499" \| "4954085" \| "5138679" \| "5615080" \| "5642999" \| "5676552" \| "5711630").PN. | USPAT | 2004/03/16 15:22 |
| - | 1 | "5353190".PN. | USPAT | 2004/03/16 15:22 |
| - | 0 | 307/10.2.ccls. and (receiv$4 with mount$3 with meter) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 15:23 |
| - | 0 | 343/711.ccls. and (receiv$4 with mount$3 with meter) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 15:23 |
| - | 104 | 340/$.ccls. and (receiv$4 with mount$3 with meter) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 15:24 |
| - | 70 | 340/$.ccls. and (receiv$4 with mount$3 with meter) and (vehicle$2 or car$2 or automobile$2) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 16:06 |

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|---|---|---|---|---|
| - | 688 | 340/5.$.ccls. and ground | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 16:25 |
| - | 108 | ((340/5.$.ccls. and ground) and (wireless or keyless)) and (vehicle or car or automobile) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 16:10 |
| - | 16 | ((340/5.$.ccls. and ground) and (wireless or keyless)) and (vehicle or car or automobile) and meter | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 16:10 |
| - | 0 | (340/5.$.ccls. and ground) and (control near receiv$4 near ground) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 16:26 |
| - | 646 | (340/5.$.ccls. and ground) and (control wtih receiv$4 with ground) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 16:26 |
| - | 22 | (340/5.$.ccls. and ground) and (control with receiv$4 with ground) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 16:38 |
| - | 1945426 | vehicle or car or automobile | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 16:45 |
| - | 924 | (vehicle or car or automobile) and (unit near meter) or (receiver near meter) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 16:41 |
| - | 33 | ((vehicle or car or automobile) and (unit near meter) or (receiver near meter)) and (mounted near meter) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/18 09:11 |
| - | 16 | (vehicle or car or automobile) and receiver near5 mount$4 near5 meter | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 17:07 |
| - | 4573 | (vehicle or car or automobile) and ((receiver or (controller adj module)) with (attach$5 or detach$5)) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 17:10 |
| - | 113 | (vehicle or car or automobile) and ((receiver or (controller adj module)) with attach$5 with detach$5) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/16 17:12 |
| - | 4 | laid.IN. | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 09:28 |
| - | 1 | open.IN. | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 09:29 |

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|---|---|---|---|---|
| - | 170 | (340/5.$.ccls. and ground) and (wireless or keyless) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 10:23 |
| - | 5 | ("4754255" \| "4881148" \| "5049867" \| "5535844" \| "5543776").PN. | USPAT | 2004/03/17 09:41 |
| - | 13 | 5864297.URPN. | USPAT | 2004/03/17 09:49 |
| - | 0 | ((340/5.$.ccls. and ground) and (wireless or keyless)) and (conductive near terminals near ground) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 10:24 |
| - | 6 | 701/$.ccls. and (conductive with terminals with ground) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 10:59 |
| - | 7 | 701/$.ccls. and (common near ground) and (wireless or keyless) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 11:04 |
| - | 60 | 340/$.ccls. and (common near ground) and (wireless or keyless) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/18 10:39 |
| - | 82 | 455/$.ccls. and (common near ground) and (wireless or keyless) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 11:19 |
| - | 30 | (455/$.ccls. and (common near ground) and (wireless or keyless)) and (vehicle or car or automobile) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 11:24 |
| - | 270 | receiv$4 near4 ground near4 control$5 near4 connect$4 | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 11:35 |
| - | 16 | (receiv$4 near4 ground near4 control$5 near4 connect$4) and (340/$.ccls.) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 11:32 |
| - | 5 | (receiv$4 near4 ground near4 control$5 near4 connect$4) and (701/$.ccls.) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 11:33 |
| - | 7 | (receiv$4 near4 ground near4 control$5 near4 connect$4) and (307/$.ccls.) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 11:33 |
| - | 3471 | receiv$4 with ground with control$5 with connect$4 | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 11:36 |
| - | 212 | (receiv$4 with ground with control$5 with connect$4) and (340/$.ccls.) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 11:37 |

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|---|---|---|---|---|
| - | 596 | (receiv$4 with ground with control$5 with connect$4) and (vehicle or car or automobile) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 14:26 |
| - | 81 | ((receiv$4 with ground with control$5 with connect$4) and (vehicle or car or automobile)) and (340/$.ccls.) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 11:54 |
| - | 27 | ((receiv$4 with ground with control$5 with connect$4) and (vehicle or car or automobile)) and (307/$.ccls.) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 11:55 |
| - | 2 | ("4119948" \| "5154617").PN. | USPAT | 2004/03/17 13:14 |
| - | 0 | receiv$5 near3 control$5 near3 shar$4 near3 ground | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 13:27 |
| - | 43 | receiv$5 near control$5 near3 connect$4 near3 ground | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 13:29 |
| - | 24 | receiv$5 near2 control$5 near2 connect$4 near2 ground | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 14:24 |
| - | 2 | 5757086.pn. | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 14:24 |
| - | 2 | 5733047.pn. | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 14:26 |
| - | 1236 | shar$4 near (ground or earth or (common adj ground)) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 14:28 |
| - | 83 | shar$4 near sam$2 near (ground or earth or (common adj ground)) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 14:41 |
| - | 6009 | sam$2 near (ground or earth or (common adj ground)) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 14:42 |
| - | 1759 | ( sam$2 near (ground or earth or (common adj ground))) same connect$4 | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 14:43 |
| - | 1048 | ( sam$2 near (ground or earth or (common adj ground))) with connect$4 | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 14:44 |
| - | 121 | ( sam$2 near (ground or earth or (common adj ground))) with connect$4 with electrical$3 | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 14:58 |

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|---|---|---|---|---|
| - | 179007 | wireless or keyless | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:00 |
| - | 1247 | (wireless or keyless) and (attach$5 near detach$5) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 15:56 |
| - | 127 | (wireless or keyless) and (attach$5 near detach$5) with receiv$4 | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 15:57 |
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| - | 29696 | (wireless or keyless) and (car vehicle automobile) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:18 |
| - | 2 | ((wireless or keyless) and (car vehicle automobile)) and (attach$5 near detach$5) near5 receiver | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:09 |
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| - | 3 | ((wireless or keyless) and (car vehicle automobile)) and (attach$5 near detach$5) with receiver | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:10 |
| - | 1 | ((wireless or keyless) and (car vehicle automobile)) and (attach$5 near detach$5) near receiv$4 | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:11 |
| - | 20 | ((wireless or keyless) and (car vehicle automobile)) and (attach$5 near detach$5) near9 receiv$4 | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:17 |
| - | 27075 | (wireless or keyless) and (car vehicle) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:18 |
| - | 2 | ((wireless or keyless) and (car vehicle)) and (attach$5 near detach$5) near control$4 | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:20 |
| - | 32 | ((wireless or keyless) and (car vehicle)) and (attach$5 near detach$5) near9 control$4 | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:32 |
| - | 18 | ((wireless or keyless) and (car vehicle)) and (attach$5 near detach$5) near9 apparatus | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:38 |

| | | | | |
|---|---|---|---|---|
| - | 3 | ((wireless or keyless) and (car vehicle)) and (attach$5 near detach$5) near (radio cd player) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:40 |
| - | 6 | ((wireless or keyless) and (car vehicle)) and (attach$5 near detach$5) near5 (radio cd player) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:41 |
| - | 0 | ((wireless or keyless) and (car vehicle)) and (attach$5 near detach$5) near5 sterio | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:43 |
| - | 0 | ((wireless or keyless) and (car vehicle)) and (attach$5 near detach$5) near5 stereo | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 16:43 |
| - | 3 | ((wireless or keyless) and (car vehicle)) and (attach$5 near detach$5) near5 player | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/17 18:36 |
| - | 96 | (vehicle or car or automobile) and receiver with mount$4 with meter | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/18 09:06 |
| - | 229 | (vehicle or car or automobile) and ((receiver or (controller adj module)) with (attach$5 and detach$5)) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/18 09:27 |
| - | 100 | 340/5.62.ccls. | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/18 09:36 |
| - | 1 | 340/$.ccls. and (transmit$5 near binary near pulse near signal$2) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/18 10:41 |
| - | 13 | transmit$5 near binary near pulse near signal$2 | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/18 10:48 |
| - | 211 | 340/$.ccls. and (transmit$5 with binary with pulse with signal$2) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/18 10:49 |
| - | 19 | (340/$.ccls. and (transmit$5 with binary with pulse with signal$2)) and (unlock$4 and lock$4) | USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB | 2004/03/18 16:15 |

US006078293A

# United States Patent [19]

Yamamoto

[11] Patent Number: 6,078,293

[45] Date of Patent: Jun. 20, 2000

[54] **ANTENNA APPARATUS FOR VEHICLES**

[75] Inventor: **Harushige Yamamoto**, Tokyo, Japan

[73] Assignee: **Niles Parts Co., Ltd.**, Tokyo, Japan

[21] Appl. No.: **09/082,148**

[22] Filed: **May 21, 1998**

[30] **Foreign Application Priority Data**

Jun. 30, 1997 [JP] Japan ..... 9-189028

[51] **Int. Cl.**[7] ..... **B60R 25/10**

[52] **U.S. Cl.** ..... **343/713**; 343/711; 340/426; 340/539; 307/10.2

[58] **Field of Search** ..... 343/713, 711, 343/712, 714; 340/426, 539, 425.5, 573; 440/61; 307/10.2

[56] **References Cited**

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5,707,262 1/1998 Huntley et al. ..... 440/61

*Primary Examiner*—Don Wong

*Assistant Examiner*—James Clinger

*Attorney, Agent, or Firm*—Ronald P. Kananen; Rader, Fishman & Grauer

[57] **ABSTRACT**

An antenna apparatus for a keyless entry device is also used for receiving a radio wave transmitted by a remote control unit within a vehicular compartment. The keyless entry device and the remote control unit are configured to generate respective radio waves having a common frequency. Both radio waves can be received by at least one antenna of a column switch and a steering wheel. The antennas are placed distant from the steering shaft and common ground pattern to improve transmitting and receiving sensitivity.

**13 Claims, 3 Drawing Sheets**

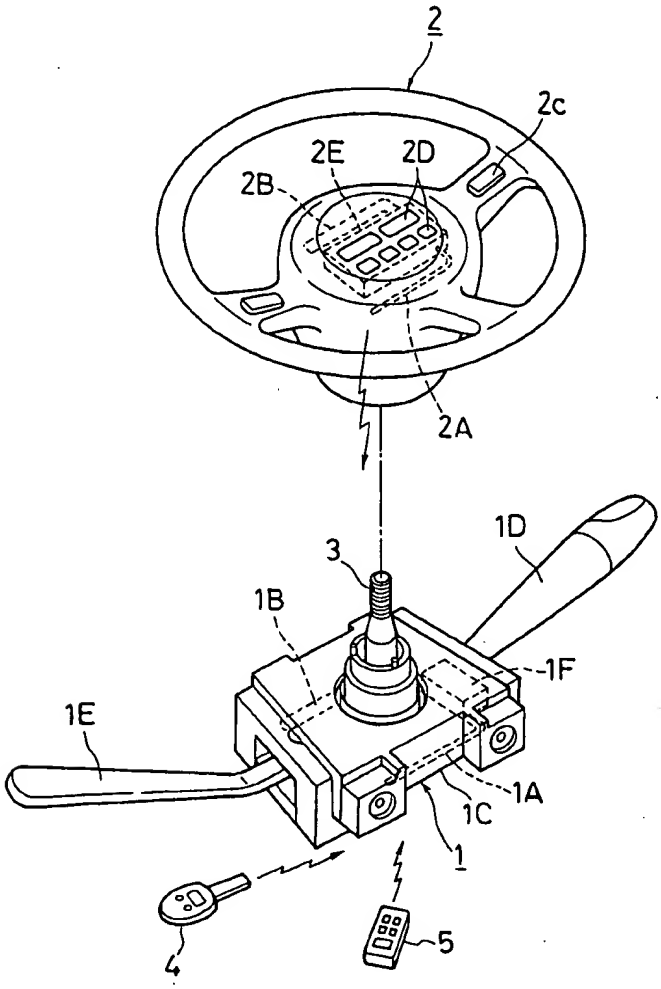
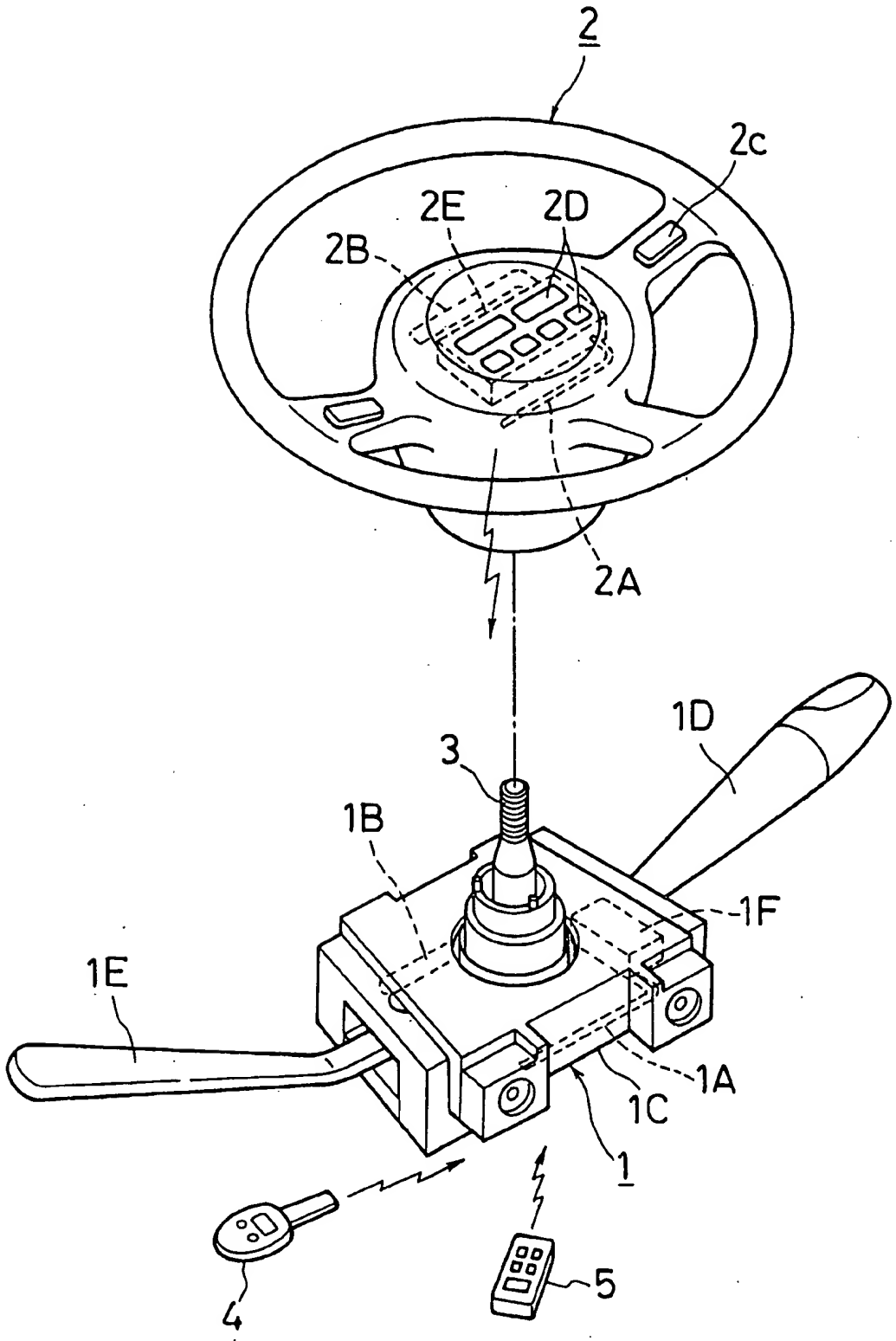


FIG. 1



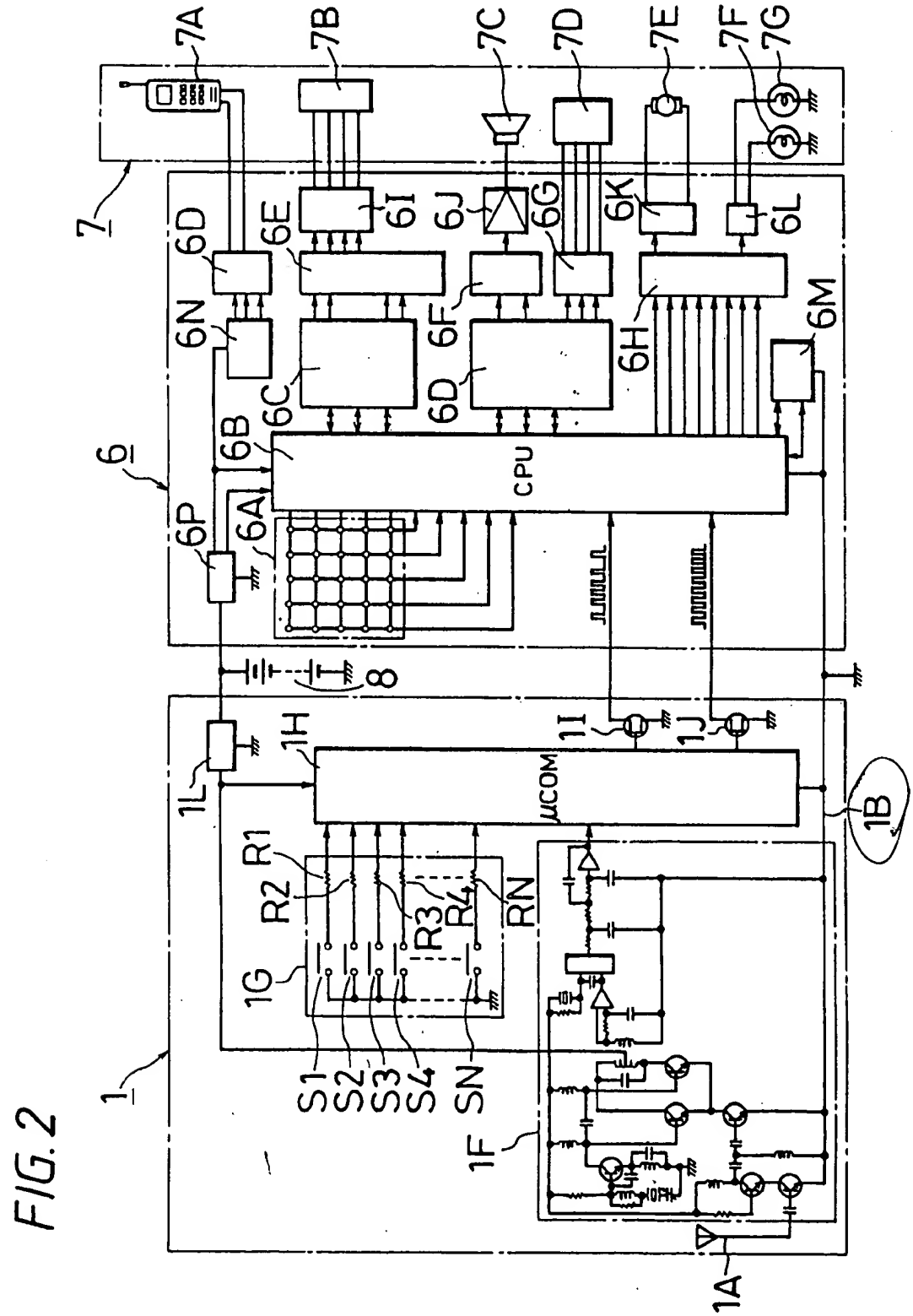

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FIG. 2

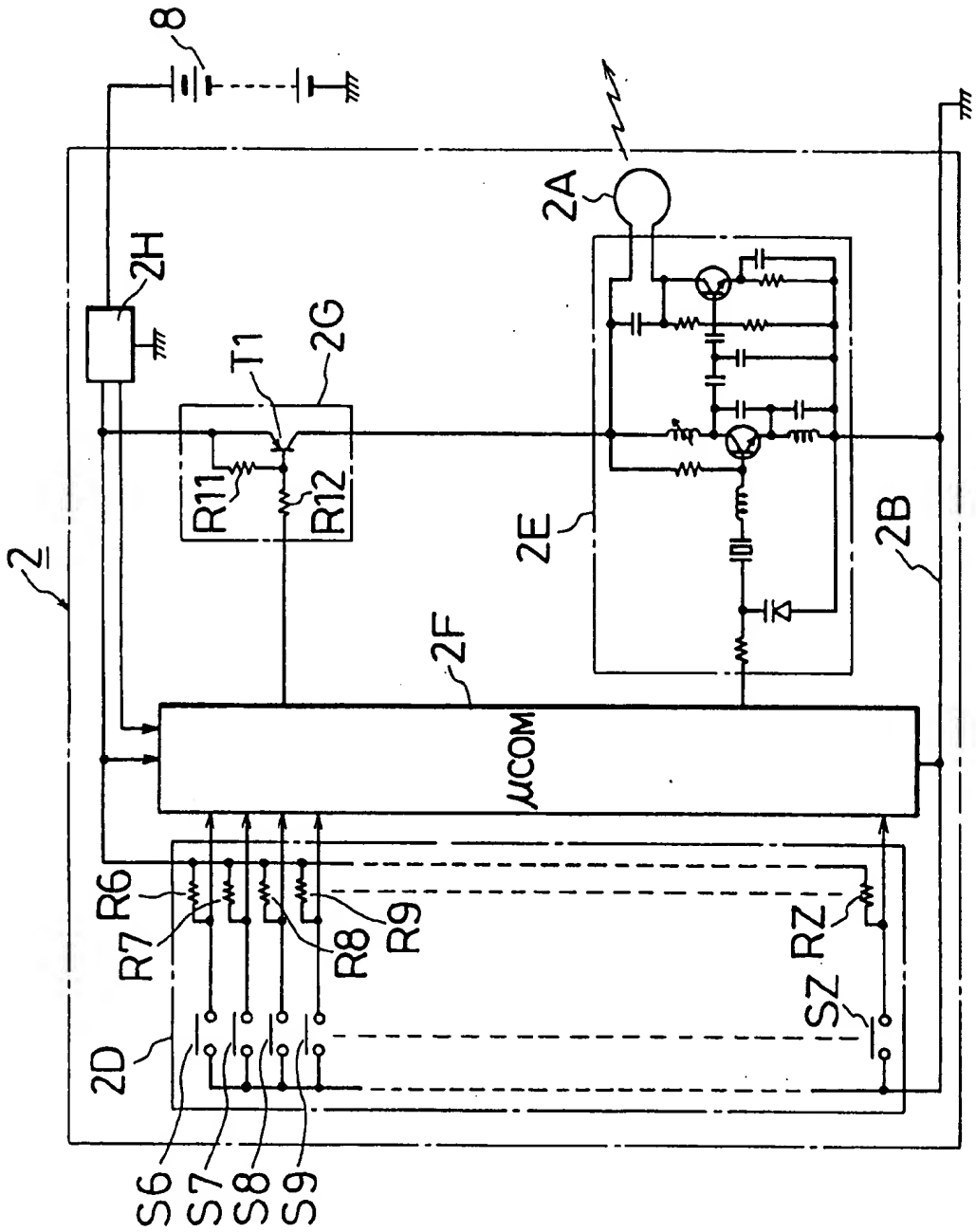


FIG. 3

# ANTENNA APPARATUS FOR VEHICLES

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to antennas. More particularly, the present invention relates to antenna apparatuses for vehicles.

2. Description of the Related Art

Certain conventional apparatuses unlock vehicular doors using radio waves. Some keyless entry apparatuses of this type have an exclusive antenna that is set, for example, on the rear window glass and a receiving circuit arranged within the trunk in order to increase the signal receiving sensitivity. The receiving circuit and the antenna are connected through a coaxial cable. One implementation of this type of arrangement is disclosed in unexamined Japanese Utility Model Publication No. H4-86382.

In some implementations, however, a coaxial cable is used to connect the receiving circuit and the antenna. Such implementations also require a connector exclusive for the coaxial cable, a case for accommodating the receiving circuit, and a power source line for supplying radio waves to the receiving circuit. These additional components can significantly increase the cost of the keyless entry system.

## SUMMARY OF THE INVENTION

An object of the present invention is to provide an antenna apparatus for a vehicle that solves the problems associated with the conventional apparatus described above.

More specifically, it is an object of the present invention to provide an inexpensive apparatus that does not require a coaxial cable for connecting the transceiver circuit and the antenna, a connector exclusive for the coaxial cable, a case for housing the transceiver circuit, and a power source line exclusive for supplying power to the transceiver circuit. The antenna is also used for receiving radio waves generated by the remote control unit within a vehicular compartment. The resulting overall reduction in the number of components reduces the cost of the vehicle.

According to one embodiment of the present invention, an antenna apparatus for vehicles is characterized in that the frequency of a radio wave generated from a keyless entry apparatus outside a vehicle and the frequency of a radio wave generated from a remote control unit inside a compartment are the same. Both radio waves are received by at least one antenna of a column switch and a handle.

In another embodiment, the antenna apparatus also makes use of a remote control unit for remote controlling a vehicular load at a seat other than the driver's seat.

According to still another embodiment, the antennas are placed at a predetermined distance from the steering shaft of the vehicle.

In yet another embodiment of the present invention, the antennas are placed at a predetermined distance from a common ground.

The above summary of the present invention is not intended to describe each illustrated embodiment or every implementation of the present invention. The figures and the detailed description that follow more particularly exemplify these embodiments.

## BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects and advantages of the present invention will become apparent upon reading the following detailed description and upon reference to the drawings. In the drawings:



FIG. 1 is an exploded view of an example antenna apparatus according to an embodiment of the present invention;

FIG. 2 is a schematic diagram illustrating an example circuit arrangement forming part of the antenna apparatus of FIG. 1, according to another embodiment of the present invention; and

FIG. 3 is a schematic diagram illustrating an example circuit arrangement forming another part of the antenna apparatus of FIG. 1, according to still another embodiment of the present invention.

## BRIEF DESCRIPTION OF THE EMBODIMENT

The invention is amenable to various modifications and alternative forms. Specifics thereof have been shown by way of example in the drawings and will be described in detail. It should be understood, however, that the intention is not to limit the invention to the particular embodiments described. On the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

## DETAILED DESCRIPTION OF THE INVENTION

The present invention is believed to be applicable to a variety of systems and arrangements for receiving remote control signals. The invention has been found to be particularly advantageous in environments in which these signals are received in a vehicle. An appreciation of various aspects of the invention can be gained through a discussion of various application examples operating in such environments.

Referring now to the drawings, FIG. 1 illustrates an example antenna apparatus according to an embodiment of the present invention. In the embodiment depicted in FIG. 1, a column switch 1 is attached to a back side of a steering wheel 2. The column switch 1 is attached, for example, to a steering column section (not shown in FIG. 1) positioned on the back side of the steering wheel 2. Operating levers 1D and 1E are disposed at the left and right hand sides of a switch main body 1C.

These levers 1D and 1E are used to operate, for example, a wiper operating system circuit, a light on/off operating system circuit, and a turn signal lamp operating system circuit of the vehicle. Actuating a lever 1D or 1E toggles one or more of a plurality of combination switch sections 1G (see FIG. 2) related, for example, to wiper operation, light on/off operation, and turn signal lamp operation within the switch main body 1C. Also, the switch main body 1C includes a printed circuit board (not shown) mounted with an antenna 1A and a transceiver circuit 1F.

FIG. 2 illustrates an example circuit incorporated into the column switch 1, according to a particular embodiment of the present invention. In the embodiment depicted in FIG. 2, the transceiver circuit 1F is configured and arranged to demodulate an encoded signal carried by a radio wave received by an antenna 1A from a transmitter in the steering wheel 2, a keyless entry apparatus 4, or a remote control device 5. The steering wheel 2, the keyless entry apparatus 4, and the remote control device 5 are configured to generate these radio waves at a common frequency. The transceiver circuit 1F has an output end connected to a microcomputer 1H at a rear stage.

As illustrated in FIG. 2, the microcomputer 1H is also connected to the combination switch section 1G. The micro-

computer 1H is programmed to output an encoded signal through a first output section 1I in response to input signals from a transceiver circuit 1F and the combination switch section 1G, and, simultaneously with the encoded signal, a synchronizing/clock signal through a second output section 1J. The encoded signal and synchronizing/clock signal are provided as inputs to a control unit 6, which is discussed below.

The transceiver circuit 1F, the combination switch section 1G, the microcomputer 1H, the first output section 1I, and the second output section 1J of the column switch 1 are connected to a common ground pattern 1B. The conductor pattern of the printed circuit board is designed such that the antenna 1A is at least, e.g., 10 mm distant from the common ground pattern 1B, and at least, e.g., 10 mm from a steering shaft 3 (see FIG. 1) positioned through the center of the column switch 1. Separating the antenna 1A from the ground improves the signal receiving sensitivity.

To unlock the door from the outside of the vehicle, the keyless entry apparatus 4 transmits a radio wave. The frequency and electric field strength of the radio wave transmitted by the keyless entry apparatus 4 are determined by the radio wave management method. In a particular embodiment, the frequency is limited to no more than several hundred MHz, and the electric field strength is restricted to several hundred $\mu$V/m at a location several meters distant from a transmission source. Therefore, where the frequency of the radio wave to be received by the antenna is set at several hundred MHz, the length of the antenna 1A may be set at several tens of centimeters. In its attaching position, the column switch 1 is close to the vehicular front glass so that the radio wave transmitted from a radio wave transmitting source can be received by the antenna 1A with high sensitivity without being blocked by the electromagnetically shielded vehicular body.

The transceiver circuit 1F shown in FIG. 2 can be implemented using a conventional FM demodulation type receiving circuit known in the art. Also, in the embodiment illustrated in FIG. 2, the combination switch section 1G is implemented using a combination of switches S1, S2, S3, S4, . . . SN and resistances R1, R2, R3, . . . RN. The column switch 1 depicted in FIG. 2 also includes a voltage regulator 1L.

A control unit 6 is connected to the column switch 1 and is configured to control vehicular loads 7. Examples of such vehicular loads 7 include, but are not limited to, a hands-free section 7A, a display section 7B, a speaker section 7C, an air-conditioning section 7D, a door locking actuator section 7E, and lamp sections 7F and 7G, incorporated, for example, into an audiovisual (AV) device provided in a center console section. The control unit 6 shown in FIG. 2 includes a touch switch 6A; CPUs 6B, 6C, and 6D; a visual driver 6E; an audio driver 6F; an air-conditioner driver 6G; a power drive section 6H; an output section 6I; an amplifier 6J; relays 6K and 6L; a ROM 6M; a controller 6N; a TEL block 6O; and a voltage regulator 6P. The column switch 1 and the control unit 6 are connected to a direct current power source 8 for the vehicle.

As illustrated in FIG. 1, the steering wheel 2 includes a remote control switch 2D set in a padded section, e.g., next to a horn switch 2C. FIG. 3 is a schematic diagram illustrating an example circuit arrangement implementing part of the steering wheel 2, according to a particular embodiment of the present invention. This circuit arrangement includes a transceiver circuit 2E for demodulating the encoded signal outputted by the microcomputer 2F for transmission as a radio wave through the antenna 2A. The encoded signal is received through an input at a front end of the transceiver circuit 2E. Demodulation is controlled using the remote control switch 2D. The radio wave transmitted by the antenna 2A is set at the same frequency as the radio wave transmitted by the keyless entry apparatus 4.

A power source of the transceiver circuit 2E is connected to a switch 2G. The switch circuit 2G comprises a transistor T1 and resistance R11 and R12, enabling activation and deactivation of the transceiver circuit 2E by the microcomputer 2F. Those skilled in the art will appreciate that the transceiver circuit 2E can be implemented using a conventional FM modulation type transmitting circuit. The remote control switch 2D comprises a combination of switches S6, S7, S8, S9, . . . SZ and resistances R6, R7, R8, R9, . . . RZ. The circuit arrangement illustrated in FIG. 3 also includes a voltage regulator 2H.

The remote control switch 2D, the transceiver circuit 2E, and the microcomputer 2F of the steering wheel 2 are connected to a common ground pattern 2B. The conductor pattern of the printed circuit board is designed such that the antenna 2A is at least, for example, 10 mm distant from the ground pattern 2B and at least 10 mm distant from the steering shaft placed through the center of the column switch 1. Separating the antenna 2A from the ground 2B improves signal receiving sensitivity.

An understanding of the operation of this embodiment of the present invention can be gained through the following discussion. For example, if a radio wave is transmitted from the keyless entry apparatus 4 outside the vehicle, the radio wave is received by the antenna 1A of the column switch 1 and provided as an input to the transceiver circuit 1F. The transceiver circuit 1F wave-detects a high frequency signal to extract an encoded signal carried by the high frequency signal, inputting it to the microcomputer 1H. The microcomputer 1H compares the inputted encoded signal with a pre-stored reference code. As a result, if an ID code for the own vehicle is detected, the microcomputer determines the kind of control code transmitted in combination with the ID code. Where the control code represents a keyless entry, a corresponding encoded signal is output to the CPU 6B of the control unit 6 and a clock signal. This causes the control unit 6 to output a control signal to a door lock actuator 7E to unlock the door.

If a radio wave is transmitted from the remote control unit 5 within rather than outside the vehicle, the radio wave is received by the antenna 1A of the column switch 1 and provided as an input to the transceiver circuit 1F. The transceiver circuit 1F wave-detects a high frequency signal to extract an encoded signal carried by the high frequency signal, inputting it to the microcomputer 1H. The microcomputer 1H determines the kind of a control code from the inputted encoded signal and a pre-stored reference code to output a corresponding encoded signal to the CPU 6B of the control unit 6 and a clock signal. This causes the control unit 6 to output a control signal to, for example, the air-conditioning section 7D or a similar subsystem.

If, on the other hand, a radio wave is transmitted from the handle 2, the radio wave is received by the antenna 1A of the column switch 1 and provided as input to the transceiver circuit 1F. The transceiver circuit 1F wave-detects a high frequency signal to extract an encoded signal carried by the high frequency signal, inputting it to the microcomputer 1H. The microcomputer 1H determines the kind of a control code from the inputted encoded signal and a pre-stored reference code to output a corresponding encoded signal to

the CPU 6B of the control unit 6 and a clock signal. This causes the control unit 6 to output a control signal to a hands-free section 7A, a display section 7B, a speaker 7C, and/or the air-conditioning section 7D or a similar subsystem.

With the radio wave generated from the keyless entry apparatus and the radio wave generated from the remote control unit inside the compartment having the same frequency, both radio waves can be received by at least one antenna of a column switch and a steering wheel. As a result, the radio wave transmitted from the keyless entry apparatus is free of obstruction by the electromagnetically shielded vehicular body and can be received by the antenna with high sensitivity. Furthermore, the antenna apparatus of the present invention is inexpensive and does not require a coaxial cable for connecting the transceiver circuit and the antenna, a connector exclusive to the coaxial cable, a case for housing the transceiver circuit, or a power source line exclusively for supplying power to the transceiver circuit. The antenna can also be used to receive the radio wave generated by the remote control unit within the vehicular compartment, reducing the total price of the vehicle.

Also, because the remote control unit can be used to control a vehicular load at a seat other than the driver's seat, another advantage offered by the present invention is that the radio wave generated at the other seat can be received by the antenna for the keyless entry apparatus. Moreover, placing the antennas distant from the steering shaft and the common ground pattern improves the transmitting and receiving sensitivity of the antenna.

The various embodiments described above are provided by way of illustration only and should not be construed to limit the invention. Those skilled in the art will readily recognize various modifications and changes that can be made to these embodiments without strictly following the example embodiments and applications illustrated and described herein, and without departing from the true spirit and scope of the present invention, which is set forth in the following claims. For example, the antenna provided in the handle can receive the radio wave transmitted by the keyless entry apparatus or the remote control unit. Also, the modulating method by using the transceiver can adopt a method other than the FM modulating method. Further, the column switch can be implemented as a switch around the vehicular handle or steering wheel, and not limited to the lever switch type illustrated in and discussed in connection with FIG. 1.

What is claimed is:

1. An antenna apparatus for use in a vehicle, comprising:
   - a first antenna located in a steering wheel of the vehicle or in a column switch adapted to be attached to a steering column of the vehicle;
   - a remote transmitter that transmits an encoded radio wave signal having a preselected frequency from a location outside the vehicle;
   - an interior transmitter located inside the vehicle that transmits an encoded radio wave signal having the same frequency as the radio wave signal transmitted by the remote transmitter; and
   - the first antenna being configured and arranged to receive the encoded radio wave signals transmitted by the remote transmitter outside the vehicle and the interior transmitter inside the vehicle.

2. An antenna apparatus according to claim 1, wherein the interior transmitter comprises a remote controller configured and arranged to control a vehicular load from a passenger seat of the vehicle other than the driver's seat.

3. An antenna apparatus according to claim 2, wherein the vehicular load comprises at least one of a hands-free communication arrangement, a display arrangement, a speaker arrangement, an air-conditioning arrangement, a door lock actuation arrangement, and a lamp arrangement.

4. An antenna apparatus according to claim 1, further comprising a steering shaft coupled to the steering wheel adjacent to the column switch, the first antenna being located at a preselected distance from the steering shaft.

5. An antenna apparatus according to claim 4, wherein the preselected distance is at least 10 mm.

6. An antenna apparatus for use in a vehicle, comprising:
   - a first antenna located in a steering wheel of the vehicle; and
   - a second antenna located in a column switch;
   - wherein the first and second antennas are configured and arranged to receive radio waves of a preselected frequency generated by at least one of a remote transmitter outside the vehicle and an interior transmitter inside the vehicle; and
   - further comprising first and second common ground patterns associated with the first and second antennas, respectively, wherein the antennas are located at a preselected distance from the common ground patterns with which they are associated.

7. An antenna apparatus according to claim 6, wherein the preselected distance is at least 10 mm.

8. An antenna apparatus according to claim 1, further comprising a transceiver circuit coupled to receive a control signal from a microcomputer located in the steering wheel and configured and arranged to demodulate the control signal for output using a second antenna, said second antenna being located in the steering wheel and said first antenna being located in the column switch.

9. An antenna apparatus for use in a vehicle, comprising:
   - a first antenna located in a steering wheel of the vehicle; and
   - a second antenna located in a column switch;
   - wherein the first and second antennas are configured and arranged to receive radio waves of a preselected frequency generated by at least one of a remote transmitter outside the vehicle and an interior transmitter inside the vehicle;
   - further comprising a transceiver circuit coupled to receive a control signal from a microcomputer and configured and arranged to demodulate the control signal for output using at least one of the first and second antennas; and
   - wherein the microcomputer is configured and arranged to receive an input signal from the transceiver circuit and, in response to the input signal, provide the control signal to the transceiver.

10. An antenna apparatus according to claim 1, wherein the remote transmitter is a keyless entry apparatus for locking and unlocking doors of the vehicle.

11. A remote control arrangement for a vehicle, comprising:
   - a keyless entry transmitter that transmits an encoded radio wave signal having a preselected frequency from a location outside the vehicle;
   - a first interior transmitter located inside the vehicle that transmits an encoded radio wave signal having the same frequency as the radio wave signal transmitted by the keyless entry transmitter; and
   - a first antenna located in a steering wheel of the vehicle or in a column switch adapted to be attached to a

steering column of the vehicle, said first antenna being configured and arranged to receive the encoded radio wave signals transmitted by the remote transmitter outside the vehicle and the first interior transmitter inside the vehicle and to communicate the signals to a transceiver circuit for controlling a vehicular load.

12. The remote control arrangement according to claim 11, wherein the first interior transmitter comprises a remote controller configured and arranged to control a vehicular load from a passenger seat of the vehicle other than a driver's seat.

13. The remote control arrangement according to claim 12, wherein said first antenna is located in said column switch, and further comprising a second interior transmitter located inside the vehicle that transmits an encoded radio wave signal having the same frequency as the radio wave signal transmitted by the keyless entry transmitter and the first interior transmitter, said second interior transmitter comprising a second antenna and a transceiver circuit located in the steering wheel.

* * * * *

# United States Patent [19]

Sato

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[45] Date of Patent: May 30, 1989


[54] AUTOMOBILE REMOTE-CONTROL SYSTEM


[75] Inventor: Kazuo Sato, Iwanuma, Japan

[73] Assignee: Alps Electric Co. Ltd., Japan



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[22] Filed: Feb. 6, 1987

[30] Foreign Application Priority Data

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[51] Int. Cl.[4] ..... H04Q 7/00

[52] U.S. Cl. ..... 340/825.690; 340/825.720; 340/825.630; 340/825.640

[58] Field of Search ..... 340/825.31, 825.44, 340/825.69, 825.72, 825.54, 825.63, 825.64; 455/228, 343, 68



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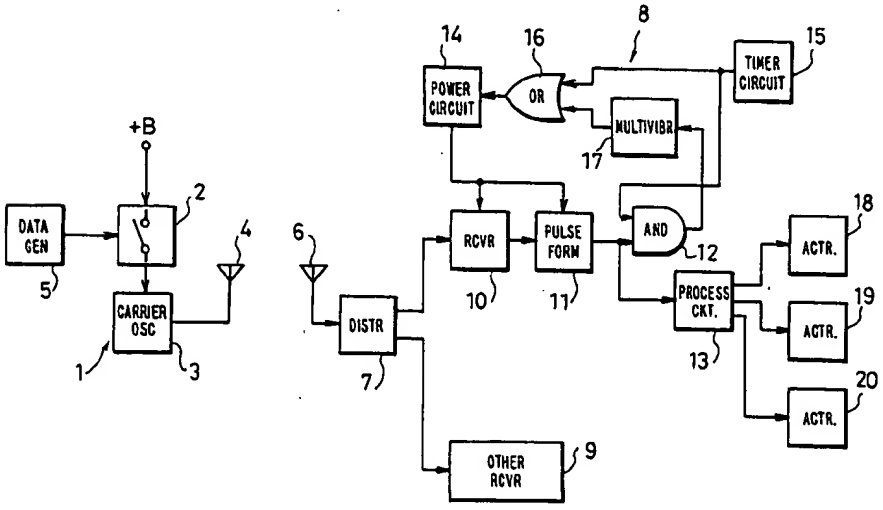
*Attorney, Agent, or Firm*—Guy W. Shoup; Paul J. Winters; Brian D. Ogonowsky



[57] ABSTRACT

An automobile remote-control system is disclosed. This system is characterized such that: a transmitter includes a carrier oscillating circuit for oscillating a carrier with a frequency higher than a radio broadcasting frequency band or a telephone transmitting-and-receiving frequency band; an operation voltage of this carrier oscillating circuit is turned ON/OFF by a drive control circuit; the carrier oscillating circuit is turned ON for a preset period prior to the transmission of the code thereby to transmit a leader pulse signal; the carrier oscillating circuit is subsequently turned ON in a pulse-like configuration at an interval corresponding to the code thereby to transmit a code pulse signal; a receiver receives the signal from the transmitter through a radio receiving antenna or a telephone transmitting-and-receiving antenna; the receiver is kept in an operation-state by a periodic operation control circuit at a cycle shorter than a continuance time of the leader pulse signal; when the leader pulse signal is detected by a detecting circuit, the receiver is held in the operation-state by an operation holding circuit; and the code pulse signal is converted into a code in accordance with a pulse interval by a code converting circuit.


4 Claims, 2 Drawing Sheets



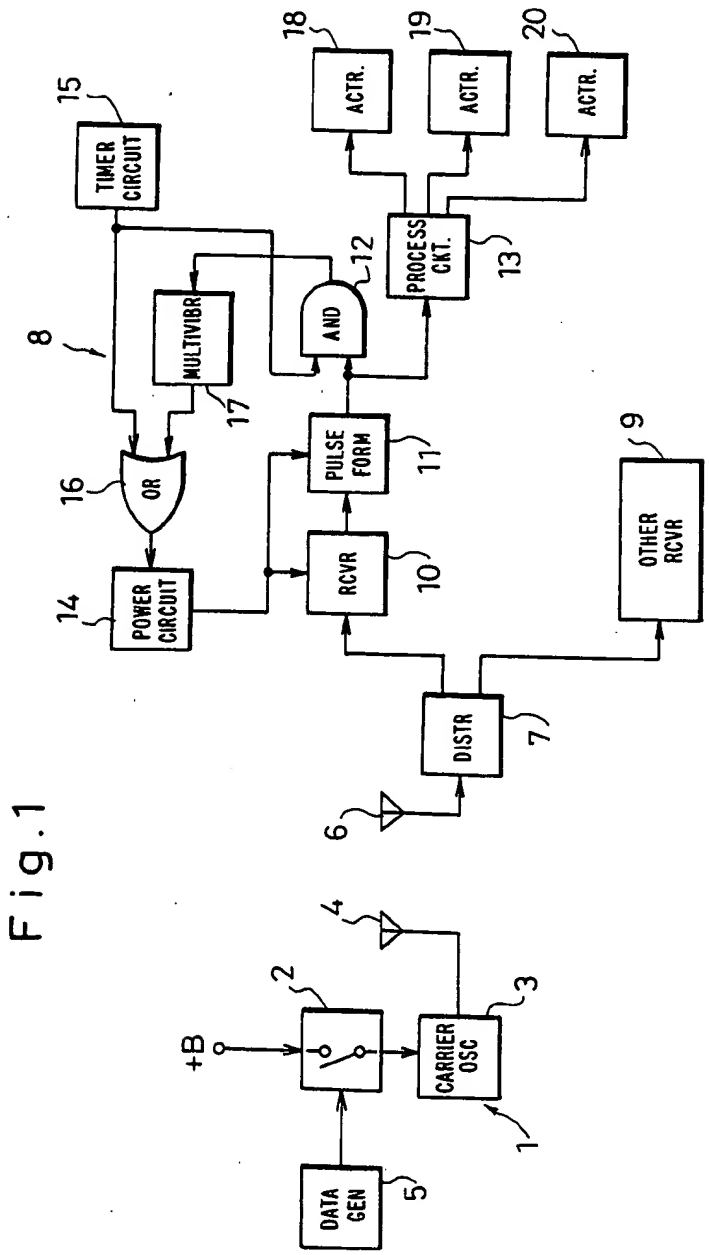

ACTR.
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Fig. 1

Fig.2(a)

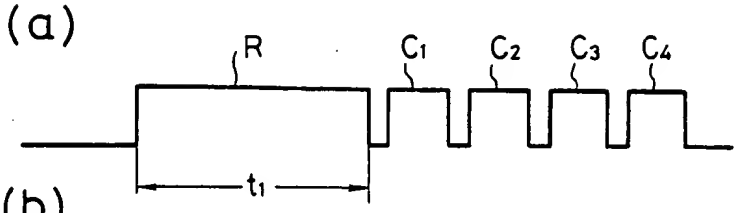



Fig.2(b)

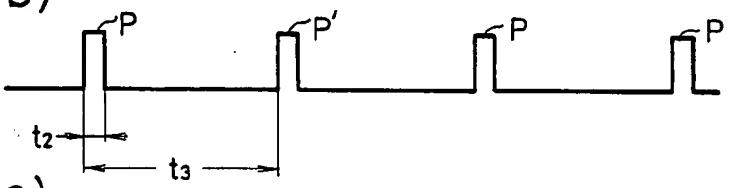



Fig.2(c)

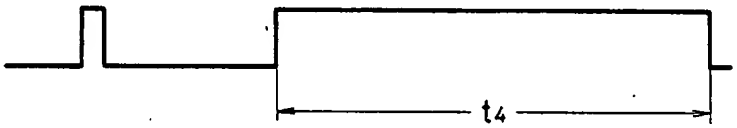



Fig.3(a)

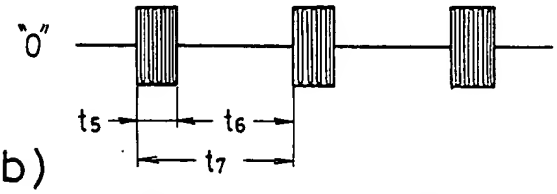
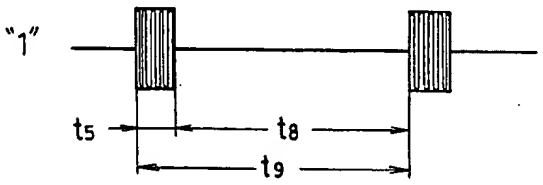



Fig.3(b)



# AUTOMOBILE REMOTE-CONTROL SYSTEM

## BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates to an automobile remote-control system for remote-controlling a door and the like of an automobile.

2. Description of the Prior Art:

There has heretofore been employed an automobile remote-control system for effecting a locking-and-unlocking operation of a door of an automobile or its trunk room and a lighting-and-extinguishing operation of a room lamp thereof. This kind of remote-control system is arranged such that the operator carries a transmitter, while the automobile is loaded with a receiver. A carrier which is so frequency-modulated or amplitude-modulated in a modulating circuit as to correspond to a code is transmitted from the transmitter, and the thus transmitted carrier is received through the intermediary of an appropriate antenna by the receiver. Subsequently, an adequate actuator is operated in accordance with the code, thereby performing the remote-control operation.

The above-described prior art automobile remote-control system is, however, attended with problems wherein the appropriate antenna has to be prepared separately from another radio receiving antenna, which arrangement not only brings about uneconomicalness but also spoils the appearance because of a plurality of antennas being protruded from the body of automobile. In addition, there arises a problem in which a dangerous situation with respect to the outer circumference of the body of automobile is worsened. Since the carrier is transmitted after being modulated in accordance with the code, a carrier oscillating circuit for outputting the carrier is consecutively controlled in an operation-state during the transmission thereof, resulting in a problem in which a large amount of electric power is consumed and a life-span of a power source battery built in the transmitter resultingly becomes short. Furthermore, the transmitter requires the modulating circuit for modulating the carrier; and at the same time a configuration of the circuit becomes intricate, which is the very obstacle both against miniaturization of the transmitter and against reduction in weight thereof. It is uncertain to know when the carrier is transmitted from the transmitter; and the receiver which is on the stand-by remains in the operation-state for a long period of time, thereby consuming a great deal of electric power of the car battery for supplying the operation voltage to the receiver.

## SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the present invention which is made with a view to obviating the above-described problems incidental to a conventional automobile remote-control system to provide a novel automobile remote-control system wherein a radio receiving antenna serves as the antenna designed for the automobile remote-control system, and a transmitter and a receiver consume less electric power.

To this end, according to one aspect of the invention, in an automobile remote-control system wherein a present code is transmitted from the transmitter and is the received by the receiver equipped in the automobile; and an actuator is operated in accordance with the aforementioned code, there is provided a novel automobile remote-control system characterized such that the transmitter includes a carrier oscillating circuit for oscillating the carrier with a frequency that is higher than a radio broadcasting frequency band or a telephone transmitting-and-receiving frequency band; an operation voltage of this carrier oscillating circuit is tuned ON/OFF by means of a drive control circuit; the carrier oscillating circuit is, at the first onset, turned ON for a predetermined period of time prior to the transmission of the code thereby to transmit a leader pulse signal; the above-mentioned carrier oscillating circuit is subsequently turned ON in a pulse-like configuration at an interval corresponding to the foregoing code thereby to transmit a code pulse signal; the above-described receiver receives the signal transmitted from the transmitter through the intermediary of the radio receiving antenna or the telephone transmitting-and-receiving antenna installed in the automobile; the receiver is kept in an operation-state by a periodic operation control circuit for a short while at a cycle shorter than a continuance time of the above-mentioned leader pulse signal; when the leader pulse signal is detected by means of a detecting circuit during the operation of the receiver, the receiver is held in the operation-state by an operation holding circuit while receiving the code pulse signal; and the above-mentioned code pulse signal is converted into a code in accordance with the pulse interval by means of a code converting circuit.

Since the frequency of the carrier of the transmitter is made higher than the radio broadcasting frequency band or the telephone transmitting-and-receiving frequency band, it is feasible to separate the signal transmitted from the transmitter from the radio broadcasting signals or the like on account of the difference between the frequency bands thereof. The radio receiving antenna may serve as the receiving antenna for the automobile remote-control system. Furthermore, the operation voltage of the carrier oscillating cirucit is turned ON/OFF thereby to transmit the code pulse signal in the pulse-like configuration at the interval corresponding to the code. Hence, the operation time of the transmitter that goes on transmitting is short, and inevitably the electric power consumed is small. Moreover, the receiver is periodically kept in the operation-state for a short time, and immediately when detecting the signal from the transmitter, the operation-state is held for the predetermined period of time. Therefore, the operation time of the receiver that is on the stand-by is short, this leading to a decrease in cosumption of electric power.

These and other objects, features and advantages of the invention will become more apparent on reading the following detailed description in connection with the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS:

FIG. 1 is a block circuit diagram of an automobile remote-control system according to the present invention;

FIGS. 2(*a*), 2(*b*), 2(*c*) are time charts each showing an operation of the automobile remote-control system show in FIG. 1; and

FIGS. 3(*a*), 3(*b*) are views each showing a constitution of a code pulse signal illustrated in FIG. 2.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT:

An embodiment of the present invention will hereinafter be described with reference to FIGS. 1 to 3. FIG

1 is a block circuit diagram of an automobile remote-control system according to the present invention. FIGS. 2(*a*), 2(*b*), 2(*c*) are time charts which in combination show operations of the automobile remote-control system depicted in FIG. 1. FIGS. 3(*a*), 3(*b*) are views each showing a constitution of a code pulse signal of FIG. 2.

In FIGS. 1 to 3 inclusive, the situation of a transmitter 1 is such that an operation voltage outputted from a built-in power source battery (not illustrated) is supplied via a drive control circuit 2 composed by a semiconductor switch and other components to a carrier oscillating circuit 3. When the carrier oscillating circuit 3 is supplied with the operation voltage, a carrier having a frequency that is higher than a radio broadcasting frequency band or a telephone transmitting-and-receiving frequency band is oscillated, thereby transmitting it from a transmitting antenna 4. Upon shut-off of the operation voltage, the carrier ceases to oscillated. Thereafter, the drive control circuit 2 in which the operation voltage is turned ON/OFF is ON/OFF-controlled by the output of a data generating circuit 5.

Data to be transmitted are formed by combinations of codes of "0" and "1". The output from the data generating circuit 5 is turned ON at a timing t5 when the code is "0" and is then kept in an OFF-state for a period t6. An interval t7 ranges from an ON-state to the next one. When the code is "1", the output of the data generating cirucit 5 remains to be ON at the timing t5 and is then turned OFF for a period t8. Similarly, an interval t9 ranges from the ON-state to the next one. It is to be remarked that the period t6 differs from the period t8, and the interval t7 likewise differs from the interval t9. The drive control circuit 2 is ON/OFF-controlled by the output from the data generating circuit 5 invested with such characteristics. When the code is "0", pulse-like carriers are, as illustrated in FIG. 3(*a*), outputted from the carrier oscillating circuit 3 at the pulse intervals t7. When the code is "1", the same carriers are, as shown in FIG. (*b*), outputted at the intervals t9. The data are converted into combinations of the pulse-like carriers having the pulse interval t7 or the interval t9 corresponding to the codes of "0" and "1", thereby transmitting them as code pulse signals C1 to C4 depicted in FIG. 2(*a*) from the transmitter 1. The code pulse signals C1 to C4 are repeatedly transmitted with no variation in content, whereby the data contents are accurately transferred to the receiver. In advance of the code pulse signals C1 to C4, a leader pulse is outputted from the data generating circuit 5 with a relatively long continuance time t1. Hence, a leader pulse signal R which continues just for a long time t1 is, as shown in FIG. 2(*a*), transmitted from the carrier oscillating circuit 3; and subsequently the code pulse signals C1 to C4 are transmitted.

In the second place, the radio receiving antenna or the telephone transmitting-and-receiving antenna 6 of the automobile is provided with a distributor 7; and the carrier from the transmitter 1 is inputted to the receiver because of the frequency-difference. Thereupon, a radio broadcasting signal or a telephone transmitting-and-receiving signal is inputted to the radio receiver or the telephone transmitter-receiver 9. In this manner, the radio receiving anstenna or the telephone transmitting-and-receiving antenna 6 serves as the receiving antenna used for the automobile remote-control system.

The operation of the receiving is that the carrier transmitted from the transmitter 1 is tuning-selected in a receiving circuit 10 and is then transferred to a pulse forming circuit 11; and the outputs of this pulse forming circuit 11 are imparted both to one input terminal of an AND circuit 12 and to a data processing circuit 13. The receiving circuit 2 and the pulse forming circuit 11 are supplied with the operation voltages by a power source circuit 14. The receiver 8 is equipped with a timable circuit 15 wherein pulses P are, as illustrated in FIG. 2(*b*), periodically outputted with a short pulse with t2 at a cycle t3 shorther than the continuance time t1 of the leader pulse signal R. The pulses P are imparted both to the other input terminal of the AND circuit 12 and to one input terminal of an OR circuit 16. The outputs of the AND circuit are sent forth to a trigger input terminal of a multi-vibrator 17 which outputs an output pulse having a pulse width t4 which constinues for a perdetermined period enough to receive the code pulse signals C1 to C4. The output pulse of the multi-vibrator 17 is given to the other input terminal of the OR circuit 16. Supplying the receiving circuit 10 and the pulse forming circuit 11 with operation voltages of the power source circuit 14 is intermittently controlled by the output of the OR circuit 16.

In such a constitution, the pulses P are imparted from a timable circuit 15 via the OR circuit 16 to the power source circuit 14, and the operation voltages are supplied from the power source circuit 14 both to the receiving circuit 10 and to the pulse forming circuit 11 during only the period t2 for which the pulses P are outputted, whereby the receiver 8 is brought to the operation. While on the other hand, the receiver 8 is in the non-operation state during a period for which the pulses P are not outputted. Under such a stand-by condition, when the leader pulse signal R and the code pulse signals C1 to C4 are, as shown in FIG. 2(*a*), transmitted from the transmitter 1, the leader pulse signals R are received by the receiving circuit 10 which is brought into the operation-state by dint of pulses P' outputted during the transmission of the leader pulse signals R, and the thus received leader pulse signals R are transmitted via the pulse forming circuit 11 to one input terminal of the AND circuit 12. At this time, inasmuch as the pulses P' are imparted from the timable circuit 15 to the other input terminal of the AND circuit 12, and the AND circuit 12 generates the output thereby to trigger the multi-vibrator 17. Thereafter, the output pulses of the multi-vibrator 17 are sent via the OR circuit 16 to the power source circuit 14; and the power source circuits 14 continuously supplies the operation voltages to the receiving circuit 10 and the pulse forming circuit 11 during the preset period t4. The code pulse signals C1 to C4 are received by virtue of the consecutive operation of the receiver 8 and are then adequately processed by the data processing circuit 13.

The data processing circuit 13 subsumes a code converting circuit wherein conversion into the codes of "0" or "1" is effected in accordance with the pulse interval t7 or the interval t9 of the code pulse signals C1 to C4 which are transmitted to the data processing circuit 13; and the data in which these codes are combined are properly processed in the data processing circuit 13. The outputs of the data processing circuit 13 are sent forth to actuators 18, 19, 20 in accordance with the data, thereby locking and unlocking the door or the trunk room of the automobile.

In the embodiment relative to the receiver 8, the timable circuit 15 involves a periodic operation control circuit, the AND circuit 12 involves a detecting circuit,

and the multi-vibrator 17 is defined as an operation holding circuit. These contitutions are not, however, limitative. Any structure is applicable, if the circuits have the same functions.

As can be clarified from the description thus far made, the automobile remote-control system according to the present invention yields the following favorable effects. Since the carrier of the transmitter is made higher than the radio broadcasting frequency band or the telephone transmitting-and-receiving frequency band, it is possible to separate the signal transmitted from the transmitter from the radio broadcasting signal or the like due to the difference between the freuencies thereof. The radio receiving antenna or the like may serve as the receiving antenna used for the automobile remote-control system according to the present invention and hence it is unnecessary to prepare an appropriate antenna. With this arrangement, the costs for producing the device are reduced as a whole, and the appearance of the automobile is not spoiled because of a small number of antennas being protruded therefrom. Furthermore, a dangerous situation attributed to the protrudent members can considerably be moderated. Inasmuch as the pulse-like carriers are transmitted at the pulse intervals according to the code while the operation voltage of the carrier oscillating circuit is turned ON/OFF, not only the operation time of the transmitter which is on the transmission is short, but also the device needs less consumption of electric power. Moreover, as in the case of this type of conventional device, the transmitter requires no modulating circuit, and constitutions of circuits are simple, which configuration facilitates a miniaturization of the transmitter and brings about a reduction in weight thereof. In addition, the receiver is periodically put into the operation-state for a short while, and the operation-state is held for a predetermined period of time immediately after detecting the signal from the transmitter, Hence, the operation time of the receiver which is on the stand-by is decreased, whereby a comparatively small amount of electric power is consumed and the battery loaded in the automobile is also small in cosumption of electric power.

What is claimed is:

1. In an automobile remote control system in which a preset code is transmitted from a remote transmitter, said code is received by a receiver installed in an automobile, and an actuator is operated in accordance with said code received by said receiver,

the improvement comprising:

said transmitter being provided with a carrier oscillating circuit for oscillating a carrier with a predetermined frequency, a power source for supplying an operating voltage to said carrier oscillating circuit, and a data generating circuit for turning said operating voltage to said carrier oscillating circuit ON and OFF selectively to transmit a code signal composed of a leader pulse signal which is ON for a predetermined leader time period and, subsequently, a series of data pulse signals during a predetermined data time period representing said preset code, wherein said data pulse signals from said transmitter have a uniform pulse width and are spaced apart either by a first data time period to indicate a binary "1" or a different, second data time period to indicate a binary "0":

said receiver being connected to an antenna installed in the automobile to receive said code signal, and having a receiving circuit, an operating circuit for operating said receiving circuit to receive the data pulse signals of said code signal received by the antenna, and a processing circuit for processing the received data pulse signals into binary information in accordance with said first and second data time periods and providing an output to the actuator in accordance with said code represented by said binary information.

2. An automobile remote-control system according to claim 1, wherein said operating circuit includes a timable circuit for generating a series of timing pulses of a relatively short pulse width spaced apart by a predetermined cycle period which is shorter than the leader time period of said leader pulse signal of said code signal received from said transmitter, a power source circuit for providing an operating voltage to said receiving circuit in response to an enabling signal, and a detecting circuit for detecting synchronous receipt of both a timing pulse from said timable circuit and said leader pulse signal of said code signal and for providing in response thereto an enabling signal to said power source circuit for enabling it to provide the operating voltage to operate said receiving circuit continuously for a predetermined operating time period, wherein said operating time period is sufficiently longer than said data time period of said code signal to allow receipt of said data pulse signals representing the preset code, said receiver otherwise being kept in a non-operated standy condition.

3. An automobile remote-control system according to claim 1, wherein the antenna is used for an automobile radio or an automobile telephone installed in the automobile, the carrier frequency used by said carrier oscillating circuit of said transmitter is higher than the frequencies of the corresponding broadcasting bands of the automobile radio or telephone connected to the antenna, and said receiver includes a distributor for routing the higher frequency carrier signal from said transmitter to said receiver.

4. An automobile remote-control system according to claim 2, wherein said detecting circuit includes and AND circuit receiving an output from said receiving circuit and said timing pulse output of said timable circuit, a multi-vibrator for providing a continuing output for said predetermined operating time period in response to a high output from said AND circuit, and an OR circuit for providing an enabling output to said power source circuit in response to either the timing pulse output of said timable circuit or the continuing output of said multi-vibrator.

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